PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant:	Alex C. Toy; John W. Forsberg	Confirmation No.	9367
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Examiner:	Michael William Kahelin		
Group Art Unit:	3762		
Docket No.:	1023-288US01		
Title:	MEDICAL DEVICE PROGRAMMER WITH REDUCED-NOISE POWER SUPPLY		

APPEAL BRIEF

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Commissioner for Patents
Alexandria, VA 22313-1450

Sir:

This is an Appeal Brief in support of an appeal from the final Office Action mailed on March 30, 2009, which finally rejected claims 1–10, 12–27, 29–43, 45–51, and 53–69. The Notice of Appeal was filed on June 29, 2009. The period for filing this Brief runs through August 31, 2009 (August 29, 2009 falls on a Saturday).

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REAL PARTY IN INTEREST

The Real Party of Interest is Medtronic, Inc. of Minneapolis, Minnesota.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences for the above-referenced patent application.

STATUS OF CLAIMS

Claims 1–10, 12–27, 29–43, 45–51, and 53–69 are pending and are the subject of this Appeal. The claims on appeal are set forth in Appendix A. The application as originally filed included claims 1–50. Originally filed claims 11, 28, and 44 were canceled by way of an Amendment filed on December 10, 2007. Claims 51–58 were added by way of a Preliminary Amendment filed on March 9, 2004. Claim 52 was subsequently canceled by way of the Amendment filed on December 10, 2007. Claim 59 was added by way of an Amendment filed on June 26, 2007. Claims 60–65 were added by way of an Amendment filed on June 23, 2008, and claims 66–69 were added by way of an Amendment filed on January 16, 2009.

Claims 1–10, 12–27, 29–43, 45–51, and 53–69 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,055,168 to Kotowski et al. (hereinafter, "Kotowski") in view of U.S. Patent Application No. 2003/0065370 to Lebel et al. (hereinafter "Lebel")..

STATUS OF AMENDMENTS

No amendments have been filed subsequent to the final Office Action mailed March 30, 2009, from which this Appeal has been made.

SUMMARY OF CLAIMED SUBJECT MATTER

All pending claims relate generally to devices, systems, and methods for converting dc power provided by a battery source to power for components within a programmer.[1] The power supply includes a pulse-skipping dc-dc boost converter.[2] The programmer selectively inhibits pulse-skipping to reduce switching noise that could otherwise undermine wireless telemetry performance between the programmer and an implanted medical device.[3]

Independent claim 1 recites a programmer[4] for a medical device, the programmer comprising a wireless telemetry circuit[5] adapted to communicate with the medical device, a boost converter[6] adapted to convert a battery voltage to an operating voltage for the programmer, and a control circuit[7] adapted to inhibit pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage.[8] Claims 2–10, 12–17, 59, and 66 are dependent on claim 1.

Independent claim 18 recites a method for controlling a power supply in a programmer[9] for a medical device, the method comprising applying a battery voltage to a boost converter[10] to convert the battery voltage to an operating voltage for the programmer and inhibiting pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage.[11] Claims 19–27, 29–34, and 67 are dependent on claim 18.

Independent claim 35 recites a system for controlling a power supply in a programmer[12] for a medical device, the system comprising means for applying[13] a battery voltage to a boost

[1] *See, e.g.*, Appellant's disclosure at p. 2, ll. 14 and 15.
[2] *See, e.g., id.* at p. 2, ll. 15 and 16.
[3] *See, e.g., id.* at p. 2, ll. 16–19.
[4] *See, e.g., id.* at p. 4, l. 13–16; p. 5, ll. 14–19; p. 12, l. 26 – p. 13, l. 5; and programmer 20 shown in FIG. 1
[5] *See, e.g., id.* at p. 4, ll. 13 and 14; p. 6, ll. 2–6; p. 6, l. 20 – p. 7, l. 4; and telemetry interface 30 shown in FIG. 1.
[6] *See, e.g., id.* at p. 7, ll. 29–31; p. 10, ll. 3–7 and 21–23; and boost converter 56 shown in FIG. 3.
[7] *See, e.g., id.* at p. 4, ll. 19–23; p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–5 and 15–19; p. 12, ll. 17–21; and power management module 38 and input circuit 54 shown in FIG. 3.
[8] *See, e.g., id.* p. 4, ll. 19–23; p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–5 and 15–19; and p. 12, ll. 17–21.
[9] *See, e.g., id.* at p. 4, l. 13–16; p. 5, ll. 14–19; p. 12, l. 26 – p. 13, l. 5; and programmer 20 shown in FIG. 1
[10] *See, e.g., id.* at p. 7, ll. 29–31; p. 10, ll. 3–7 and 21–23; and boost converter 56 shown in FIG. 3.
[11] *See, e.g., id.* at p. 2, ll. 28 and 29; p. 4, ll. 19–23; p. 8, l. 21 – p. 9, l. 21; p. 10, ll. 3–5 and 15–19; and p. 12, ll. 17–21.
[12] *See, e.g., id.* at p. 4, l. 13–16; p. 5, ll. 14–19; p. 12, l. 26 – p. 13, l. 5; and programmer 20 shown in FIG. 1
[13] *See, e.g., id.* at p. 9, ll. 23 and 24; p. 10, ll. 12 and 13; and power management module 38 and input circuit 54 shown in FIG. 3.

converter[14] to convert the battery voltage to an operating voltage for the programmer[15] and means for inhibiting pulse skipping[16] by the boost converter when a level of the battery voltage is greater than a threshold voltage.[17] Claims 36–43, 45–50, and 68 are dependent on claim 35.

Independent claim 51 recites a neurostimulation system comprising an implantable neurostimulator[18] and a programmer[19] for the neurostimulator, the programmer including a wireless telemetry circuit[20] adapted to communicate with the medical device, a boost converter[21] adapted to convert a battery voltage to an operating voltage for the programmer, wherein the boost converter activates pulse skipping when the operating voltage exceeds a reference voltage,[22] and the boost converter is a fixed-frequency switching mode boost converter,[23] and a control circuit[24] adapted to inhibit pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage.[25] Claims 53–58 and 69 are dependent on claim 51.

Independent claim 60 recites a programmer[26] for a medical device, the programmer comprising a wireless telemetry circuit [27]configured to communicate with the medical device, a fixed-frequency, switching mode boost converter[28] configured to convert a battery voltage to an operating voltage for the programmer, wherein the boost converter performs pulse skipping when the operating voltage exceeds a reference voltage, [29] and a control circuit[30] configured to

[14] *See, e.g., id.* at p. 7, ll. 29–31; p. 10, ll. 3–7 and 21–23; and boost converter 56 shown in FIG. 3.
[15] *See, e.g., id.* at p. 2, l. 31 – p. 3, l. 2; p. 7, ll. 29–31; p. 9, ll. 23 and 24; p. 10, ll. 12 and 13; p. 12, ll. 21–23; and power management module 38 and input circuit 54 shown in FIG. 3.
[16] *See, e.g., id.* at p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3-10; p. 12, ll. 21–23; and power management module 38 and input circuit 54 shown in FIG. 3.
[17] *See, e.g., id.* at p. 3, ll. 2 and 3; p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–10 and 15–19; and p. 12, ll. 17–21.
[18] *See, e.g., id.* at p. 4, ll. 8 and 9; and implantable medical device 12 shown in FIG. 1.
[19] *See, e.g., id.* at p. 4, l. 13–16; p. 5, ll. 14–19; p. 12, l. 26 – p. 13, l. 5; and programmer 20 shown in FIG. 1
[20] *See, e.g., id.* at p. 4, ll. 13 and 14; p. 6, ll. 2–6; p. 6, l. 20 – p. 7, l. 4; and telemetry interface 30 shown in FIG. 1.
[21] *See, e.g., id.* at p. 7, ll. 29–31; p. 10, ll. 3–7 and 21–23; and boost converter 56 shown in FIG. 3.
[22] *See, e.g., id.* at p. 10, l. 30 – p. 11, l. 4.
[23] *See, e.g., id.* at p. 8, ll. 5–12.
[24] *See, e.g., id.* at p. 4, ll. 19–23; p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–5 and 15–19; p. 12, ll. 17–21; and power management module 38 and input circuit 54 shown in FIG. 3.
[25] *See, e.g., id.* at p. 4, ll. 19–23; p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–5 and 15–19; and p. 12, ll. 17–21.
[26] *See, e.g., id.* at p. 4, l. 13–16; p. 5, ll. 14–19; p. 12, l. 26 – p. 13, l. 5; and programmer 20 shown in FIG. 1
[27] *See, e.g., id.* at p. 4, ll. 13 and 14; p. 6, ll. 2–6; p. 6, l. 20 – p. 7, l. 4; and telemetry interface 30 shown in FIG. 1.
[28] *See, e.g., id.* at p. 7, ll. 29–31; p. 8, ll. 5–12; p. 10, ll. 3–7 and 21–23; and boost converter 56 shown in FIG. 3.
[29] *See, e.g., id.* at p. 10, l. 30 – p. 11, l. 4.
[30] *See, e.g., id.* at p. 4, ll. 19–23; p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–5 and 15- 19; p. 12, ll. 17–21; and power management module 38 and input circuit 54 shown in FIG. 3.

limit a level of the battery voltage applied to the boost converter when the battery voltage exceeds a threshold voltage,[31] thereby inhibiting performance of pulse skipping by the boost converter.[32] Claim 61 is dependent on claim 60.

Independent claim 62 recites a method for controlling a power supply in a programmer[33] for a medical device, the method comprising applying a battery voltage[34] to a fixed-frequency, switching mode boost converter[35] to convert the battery voltage to an operating voltage for the programmer,[36] wherein the boost converter performs pulse skipping when the operating voltage exceeds a reference voltage,[37] and limiting a level of the battery voltage applied to the boost converter when the battery voltage exceeds a threshold voltage,[38] thereby inhibiting performance of pulse skipping by the boost converter.[39] Claim 63 is dependent on claim 62.

Independent claim 64 recites a device for controlling a power supply in a programmer[40] for a medical device, the device comprising means for applying[41] a battery voltage to a fixed-frequency, switching mode boost converter[42] to convert the battery voltage to an operating voltage for the programmer,[43] wherein the boost converter performs pulse skipping when the operating voltage exceeds a reference voltage,[44] and means for limiting[45] a level of the battery voltage applied to the boost converter when the battery voltage exceeds a threshold voltage,[46]

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[31] *See, e.g., id.* at p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–19; and p. 12, ll. 17–21.
[32] *See, e.g., id.* at p. 4, ll. 19–23; p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–19; and p. 12, ll. 17–21.
[33] *See, e.g., id.* at p. 4, l. 13–16; p. 5, ll. 14–19; p. 12, l. 26 – p. 13, l. 5; and programmer 20 shown in FIG. 1
[34] *See, e.g., id.* at p. 7, ll. 29–31; and p. 10, ll. 3–7 and 21–23.
[35] *See, e.g., id.* at p. 7, ll. 29–31; p. 8, ll. 5–12; p. 10, ll. 3–7 and 21–23; and boost converter 56 shown in FIG. 3.
[36] *See, e.g., id.* at p. 7, l. 29 – p. 8, l. 12; p. 9, ll. 23 and 24; p. 10, ll. 12 and 13; and p. 12, ll. 21–23.
[37] *See, e.g., id.* at p. 10, l. 27 – p. 11, l. 4.
[38] *See, e.g., id.* at p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–19; and p. 12, ll. 17–21.
[39] *See, e.g., id.* at p. 4, ll. 19–23; p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–19; and p. 12, ll. 17–21.
[40] *See, e.g., id.* at p. 4, l. 13–16; p. 5, ll. 14–19; p. 12, l. 26 – p. 13, l. 5; and programmer 20 shown in FIG. 1
[41] *See, e.g., id.* at p. 9, ll. 23 and 24; p. 10, ll. 12 and 13; and power management module 38 and input circuit 54 shown in FIG. 3.
[42] *See, e.g., id.* at p. 7, ll. 29–31; p. 8, ll. 5–12; p. 10, ll. 3–7 and 21–23; and boost converter 56 shown in FIG. 3.
[43] *See, e.g., id.* at p. 2, l. 31 – p. 3, l. 2; p. 7, ll. 29–31; p. 9, ll. 23 and 24; p. 10, ll. 12 and 13; p. 12, ll. 21–23; and power management module 38 and input circuit 54 shown in FIG. 3.
[44] *See, e.g., id* at p. 10, l. 27 – p. 11, l. 4.
[45] *See, e.g., id* at p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–19; p. 12, ll. 17–21; and power management module 38 and input circuit 54 shown in FIG. 3.
[46] *See, e.g., id.* p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–19; and p. 12, ll. 17–21.

thereby inhibiting performance of pulse skipping by the boost converter.[47] Claim 65 is dependent on claim 64.

Claims 38 depends from claim 35 and specifies that the battery voltage is transmitted to the boost converter via a transistor,[48] and the system further comprises means for turning the transistor OFF[49] when the battery voltage exceeds the threshold voltage.[50]

Claim 45 depends from claim 35 and specifies that the system of claim 35 further comprises means for inhibiting pulse skipping[51] by the boost converter by limiting the level of the battery voltage applied to the boost converter.[52]

Claim 65 depends from claim 64 and specifies that the device further comprises means for transmitting[53] the battery voltage to the boost converter via a transistor[54] when the transistor is ON, wherein the means for limiting a level of the battery voltage applied to the boost converter comprises means for turning the transistor OFF[55] when the battery voltage exceeds the threshold voltage.

Claim 68 depends from claim 35 and specifies that the system of claim 35 further comprises means for comparing the level of the battery voltage to the threshold voltage.[56]

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[47] *See, e.g., id.* at p. 4, ll. 19–23; p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–19; and p. 12, ll. 17–21.
[48] *See, e.g., id.* at p. 8, ll. 29–31; p. 10, ll. 12 and 13; p. 11, ll. 7–9, p. 12, ll. 21–23; and MOSFET shown in FIG. 4.
[49] *See, e.g., id.* at p. 8, l. 29 – p. 9, l. 2; p. 11, ll. 19-25' p. 12, ll. 18-21; programmer 20 shown in FIG. 1; and power management module 38 shown in FIG. 3.
[50] *See, e.g., id.* at p. 8, l. 29 – p. 9, l. 2; p. 11, ll. 19-25; and p. 12, ll. 18-21.
[51] *See, e.g., id.* at p. 8, l. 21 – p. 9, l. 2; p. 10, ll. 3–19; p. 12, ll. 17–21; and power management module 38 and input circuit 54 shown in FIG. 3.
[52] *See, e.g., id.* at p. 8, l. 29 – p. 9, l. 2; p. 10, ll. 3-19; and p. 12, ll. 17-21.
[53] *See, e.g., id.* at p. 9, ll. 23 and 24; p. 10, ll. 12 and 13; p. 12, ll. 21-23; and power management module 38 and input circuit 54 shown in FIG. 3.
[54] *See, e.g., id.* at p. 10, ll. 12 and 13; and MOSFET 60 shown in FIG. 4.
[55] *See, e.g., id.* at p. 8, l. 29 – p. 9, l. 2; p. 11, ll. 19-25; p. 12, ll. 18-21; programmer 20 shown in FIG. 1; and power management module 38 and input circuit 54 shown in FIG. 3.
[56] *See, e.g., id.* at p. 8, ll. 22-24; p. 10, ll. 7 and 8; p. 12, ll. 17 and 18; and power management module 38 and comparator 58 shown in FIG. 3.

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

The ground of rejection to be reviewed on appeal is the final rejection of claims 1–10, 12–27, 29–43, 45–51, and 53–69 under 35 U.S.C. § 103(a) as being unpatentable over Kotowski in view of Lebel.

ARGUMENT

Rejection of Claims 1–10, 12–27, 29–43, 45–51, and 53–69 as Being Obvious Over Kotowski in View of Lebel

The Examiner's final rejection of claims 1–10, 12–27, 29–43, 45–51, and 53–69 was in error. Appellant respectfully requests reversal of the rejection by the Board of Patent Appeals based on the arguments below. Appellant respectfully requests separate review of each set of claims argued under separate headings.

Claims 1–3, 10, 12, 14–20, 27, 29, 31–37, 43, 45, 47–51, 53, 55–59, and 66–69

In support of the rejection of independent claims 1, 18, 35, 51, 60, 62, and 64, the Examiner stated that Kotowski discloses a boost converter to convert a battery voltage to an operating voltage and a control circuit to inhibit pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage.[57] The Examiner reasoned that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Kotowski by providing the voltage converter to a handheld programmer having an internal antenna in combination with a neurostimulator because Lebel teaches a handheld programmer that utilizes a boost converter.[58] The Examiner's conclusion of obviousness is erroneous. As discussed in further detail below, Kotowski fails to disclose or suggest, among other things, a controller circuit adapted to inhibit of pulse skipping by a boost converter when a level of the battery voltage is greater than a threshold voltage, as required by Appellant's independent claim 1.

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[57] Final Office Action dated 3/30/09 at pp. 2–3, item 4.
[58] *Id.* at p. 3, item 4.

Kotowski describes a switched capacitor circuit that receives an unregulated voltage (e.g., from a battery) and outputs a regulated voltage to an electronic device or load.[59] The gain of the switched capacitor circuit is selected based on a desired output voltage or load current and must also be greater than a minimum gain needed to ensure that the desired output voltage is met or exceeded.[60] The minimum gain is determined based on the input voltage of the switched capacitor circuit.[61]

Kotowski also discloses a comparator that compares the output voltage of the switched capacitor circuit to the desired output voltage for the switched capacitor circuit.[62] According to Kotowski, if the output voltage is less than the desired output voltage, the comparator sends a "pump" signal to the switched capacitor circuit to indicate that more current is needed.[63] In response to receiving the "pump" signal, the switched capacitor circuit maintains the frequency of clock pulses, i.e., does not skip a clock pulse.[64] If the output voltage is greater than or equal to the desired output, the comparator sends a skip signal to the switched capacitor circuit to indicate that the output voltage is sufficient and the switched capacitor circuit should not transfer any more charge to the output, i.e., the switched capacitor circuit should skip a clock pulse.[65]

According to Kotowski, the gain of the switched capacitor circuit is increased or decreased based on the trend of the output voltages.[66] For example, if a consecutive number of "pump" signals are detected, the gain is increased. Likewise, if a consecutive number of "skip" signals are detected, the gain is decreased. Regardless of the number of consecutive "skip" signals, the gain is not allowed to decrease below a minimum gain.[67] According to Kotowski, the minimum gain is the minimum gain needed to ensure that the desired output voltage is met or exceeded.[68] The value of the minimum gain is based on the voltage input into the switched array

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[59] Kotowski at col. 3, ll. 10–19.
[60] *Id.* at col. 3, ll. 1–5.
[61] *Id.* at col. 3, l. 9 to col. 4, l. 8.
[62] *Id.* at col. 3, ll. 36–55.
[63] *Id.* at col. 3, ll. 26–30.
[64] *Id*
[65] *Id.* at col. 3, ll. 19–35.
[66] *Id.* at col. 3, ll. 36–44.
[67] *Id.* at col. 3, ll. 56–60.
[68] *Id.* at col. 3, ll. 56–60.

circuit, the desired output voltage, and the gain configurations allowed by the switched array circuit.[69]

The Examiner reasoned that because Kotowski discloses that an "input (battery) voltage is used to select the gain based on a number of thresholds" and "the gain is used to inhibit pulse skipping," Kotowski discloses pulse skipping that is inhibited when the battery voltage exceeds an arbitrary threshold voltage.[70] This analysis is erroneous and is unsupported by Kotowski. While Kotowski discloses that an input voltage (from a battery) is used to select a <u>minimum</u> gain, Kotowski does not disclose or suggest that any other gain settings, such as gain settings that are used to determine the output voltage, are selected based on the input voltage. Kotowski discloses that the gain settings used to determine the output voltage for the switched capacitor circuit are selected based on the trend of the output voltages.[71] For example, as discussed above, Kotowski discloses that if a consecutive number of "pump" signals are detected, the gain is increased. The minimum gain is merely used as a floor below which the gain is not allowed to decrease.[72] Thus, the Examiner's assertion that Kotowski discloses that a battery voltage is used to select gain is only applicable to the <u>minimum</u> gain.

Moreover, Kotowski does not disclose or suggest that pulse skipping is inhibited when a level of a battery voltage is greater than a threshold voltage, as required by claim 1. The Examiner stated that in Kotowski, "pulse skipping is inhibited by modifying the gain parameter such that subsequent pulses are less likely to be skipped."[73] Kotowski discloses that when a level of an output voltage of the switched capacitor circuit (and not an output voltage of the <u>battery</u>) is greater than a desired output voltage, the switched capacitor circuit skips a clock pulse, and when the switched capacitor skips a clock pulse a threshold number of times, the gain is decreased. The gain parameter that is modified, however, is not the minimum gain that is based on the battery voltage, but an actual gain for a switched capacitor circuit.

The mere fact that a gain parameter is modified because of a recent trend in skip signals does not indicate that the battery voltage is greater than or equal to a threshold value. Rather, in

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[69] *Id.* at col. 3, ll. 60–65.
[70] Final Office Action dated 3/30/09 at p. 3, item 4.
[71] Kotowski at col. 3, ll. 36–44.
[72] *Id.* at col. 4, ll. 1–3.
[73] Office Action dated 10/16/08 at p. 6, item 12.

Kotowski, if a gain parameter is modified because of a certain number of skip signals have been detected, it can only be discerned that the gain value was undesirable. The gain that is modified by Kotowski in response to a number of detected skip signals is unrelated to the battery voltage.

Moreover, while the actual gain may be decreased in an attempt to minimize pulse skipping, decreasing the gain does not necessarily result in the inhibition of pulse skipping by the switched capacitor circuit, as the Examiner asserts.[74] Rather, based on the Kotowski disclosure, it appears that the switched capacitor circuit may continue skipping clock pulses even after the gain is decreased. Indeed, based on the Kotowski disclosure, it appears that decreasing the gain may result in the same amount of pulse skipping, rather than an inhibition of pulse skipping, as required by Appellant's claim 1. For example, in Kotowski, when the actual gain reaches the minimum gain, any number of consecutive pulse skips will be allowed, because the gain cannot be further reduced past the minimum gain. Therefore, decreasing the gain does not necessarily reduce pulse skipping. Rather, the amount of pulse skipping may be the same regardless of the gain configuration. In this manner, even if the "minimum gain" that Kotowski discloses is selected based on the input voltage,[75] the minimum gain may promote pulse skipping rather than inhibit it.

In the Response to Arguments provided in the final Office Action, the Examiner asserted "[e]ven if Kotowski does not inhibit pulse skipping when the actual gain reaches the minimum gain, Kotowski does inhibit pulse skipping over the remaining ranges of gain values."[76] The Kotowski disclosure does not support the Examiner's assertion. Although Kotowski describes decreasing the gain after a consecutive number of skip pulses, pulse skipping is not necessarily inhibited. As described above, the same amount of pulse skipping may occur regardless of the gain configuration.

The Examiner asserted that Kotowski discloses that the applied gain of the switched capacitor circuit is decreased when the battery voltage is greater than a threshold voltage.[77] However, Kotowski fails to provide any disclosure to support such an assertion. Kotowski

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[74] Final Office Action dated 3/30/09 at p. 8, item 14.
[75] Kotowski at col. 3, ll. 60–61.
[76] Final Office Action dated 3/30/09 at p. 7, item 12.
[77] Office Action dated 10/16/08 at p. 6, item 12.

discloses that an applied gain setting that is decreased when the <u>output</u> voltage of the switched capacitor circuit, not the voltage of the battery, exceeds the desired output voltage a threshold number of times.[78] The gain setting reduction does not <u>necessarily</u> occur when a level of the battery voltage is greater than a threshold voltage. Thus, even if decreasing the applied gain amounts to an inhibition of pulse skipping, an assertion with which Appellant disagrees, Kotowski fails to disclose or suggest inhibiting pulse skipping by a boost converter when a level of the <u>battery</u> voltage is greater than a threshold voltage, as required by Appellant's claim 1.

The Examiner reasoned that because the output value in Kotowski is based on the input voltage and gain, when the output voltage exceeds a threshold, it necessarily follows that the input voltage exceeds a threshold.[79] The Examiner erroneously characterized the threshold that the input voltage exceeds as an <u>arbitrary</u> level which causes the appropriate number of "skip" signals required to modify the gain to be generated.[80] A threshold value cannot reasonably be characterized as an arbitrary voltage level. A threshold value, by its very nature, is a predetermined value. Thus, although the claims do not explicitly state that the threshold is predetermined or preset, to characterize a threshold value as an arbitrary value is to effectively vitiate the requirement of claim 1 that a control circuit is adapted to inhibit pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage.

Moreover, in Kotowski, when the output voltage of the switched capacitor circuit exceeds a desired output voltage, it does not necessarily follow that the input voltage (from the battery) exceeds a threshold, as asserted by the Examiner.[81] An output voltage that exceeds the desired output voltage may simply indicate that the gain setting is too large for the given input voltage and desired output voltage. Thus, a reduction in the gain setting of the switched capacitor circuit may merely indicate that the gain setting was too high for the input voltage, thereby resulting in an output voltage that is greater than a desired output voltage. A reduction in a gain setting does not <u>necessarily</u> indicate that the input voltage exceeds a threshold voltage.

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[78] *See* Kotowski at col. 3, ll. 20–43.
[79] Final Office Action dated 3/30/09 at pp. 7 and 8, item 13.
[80] *Id.* at p. 7, item 13.
[81] *Id.* at pp. 7 and 8, item 13.

The fact that a certain characteristic may be present in the prior art is not sufficient to establish the inherency of that result or characteristic.[82] There must be a basis in fact and/or technical reasoning to reasonably support a determination that an allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.[83] Kotowski does not provide reasonable support for the determination that in Kotowski, the reduction in a gain setting necessarily indicates that the input voltage from the battery exceeds a threshold voltage. The output voltage of the Kotowski switched capacitor circuit does not in any way suggest that the input voltage (i.e., the battery voltage according to the Examiner) is greater than a threshold voltage, as suggested by the Examiner. As discussed above, Kotowski fails to disclose or suggest any particular relationship between the applied gain setting (which is different than the minimum gain) and the input voltage to the switched capacitor circuit. For at least these reasons, Kotowski fails to inherently disclose a control circuit that is adapted to inhibit pulse skipping by a boost converter when a level of the battery voltage is greater than a threshold voltage.

Kotowski fails to contemplate the programmer of Appellant's claim 1. In Kotowski, if the output voltage of the switched capacitor circuit exceeds a threshold, the switched capacitor skips a clock pulse, which seems generally consistent with a standard pulse skipping operation. In contrast, Appellant's independent claims require the boost converter to inhibit pulse skipping when a level of a battery voltage is greater than a threshold voltage. Whereas Kotowski considers the output voltage for purposes of pulse skipping, the claimed invention considers the battery voltage for purposes of inhibiting pulse skipping. The battery voltage is different than the output voltage of the switched capacitor circuit disclosed by Kotowski.

For at least these reasons, Kotowski does not provide any suggestion of inhibiting pulse skipping when a level of battery voltage is greater than a threshold voltage, as recited by claim 1. Lebel also fails to disclose or suggest the control circuit recited in claim 1. Accordingly, claim 1 is patentable over Kotowski in view of Lebel, and the Examiner's rejection of claim 1 as being obvious over Kotowski in view of Lebel was in error.

For at least the reasons discussed above with respect to independent claim 1, Kotowski in view of Lebel also fails to disclose or suggest a method that comprises applying a battery voltage

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[82] *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ.2d 1955, 1957 (Fed. Cir. 1993); MPEP § 2112.
[83] *Ex parte Levy*, 17 USPQ.2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original); MPEP 2112.

to a boost converter to convert the battery voltage to an operating voltage for the programmer and inhibiting pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage, as recited by independent claim 18.

In addition, for at least the reasons discussed above with respect to independent claim 1, independent claim 35 and 51 are patentable over Kotowski in view of Lebel. For example, Kotowski in view of Lebel fails to disclose or suggest a system for controlling a power supply in a programmer for a medical device, the system comprising means for applying a battery voltage to a boost converter to convert the battery voltage to an operating voltage for the programmer and means for inhibiting pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage, as recited by claim 35. As another example, Kotowski in view of Lebel fails to disclose or suggest a programmer that includes, among other things, a fixed-frequency switching mode boost converter adapted to convert a battery voltage to an operating voltage for the programmer, where the boost converter activates pulse skipping when the operating voltage exceeds a reference voltage, and a control circuit adapted to inhibit pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage.

Claims 2, 3, 10, 12, 14–17, 19, 20, 27, 29, 31–34, 36, 37, 43, 45, 47–50, 53, 55, 57–59, and 66–69 depend from one of independent claims 1, 18, 35, and 51, and are patentable over Kotowski in view of Lebel for at least the reasons discussed above with respect to the independent claims.

Claims 60, 62, and 64

For at least the reasons discussed above with respect to independent claim 1, Kotowski in view of Lebel fails to disclose each and every element of Appellant's independent claims 60, 62, and 64. For example, Kotowski in view of Lebel fails to disclose a programmer including a fixed-frequency, switching mode boost converter configured to convert a battery voltage to an operating voltage for the programmer, where the boost converter performs pulse skipping when the operating voltage exceeds a reference voltage, as recited by claim 60. As another example, Kotowski in view of Lebel fails to disclose applying a battery voltage to a fixed-frequency,

switching mode boost converter to convert the battery voltage to an operating voltage for the programmer, where the boost converter performs pulse skipping when the operating voltage exceeds a reference voltage, as required by claims 62 and 64.

Independent claims 60, 62, and 64 further require inhibiting pulse skipping by the boost converter by limiting the level of the battery voltage applied to the boost converter. Neither Lebel nor Kotowski discloses or suggests inhibiting pulse skipping by the boost converter by limiting the level of the battery voltage applied to the boost converter. The Examiner erroneously asserted that FIG. 5 of Kotowski discloses the limitations of claims 13, 30, 46, and 54.[84]

As illustrated in FIG. 3 of Kotowski, the switched capacitor array 310 is a component of DC-DC converter 300 and an input voltage from a battery is input to the switched capacitor array 310.[85] Kotowski does not disclose or suggest that the level of battery voltage <u>applied to</u> converter 300 can be limited. Instead, Kotowski discloses that capacitor array 310 within converter 300 merely receives the input voltage from the battery. While Kotowski discloses that the gain of capacitor array 310 <u>within</u> converter 300 may be adjusted, Kotowski does not disclose that the level of battery voltage <u>applied to</u> converter 300 may be adjusted. FIG. 5 illustrates another embodiment of a capacitor array, and similarly fails to illustrate that the input voltage Vin applied to the capacitor array may be limited. Thus, FIG. 5 of Kotowski fails to disclose inhibition of pulse skipping by a boost converter by limiting the level of the battery voltage applied to the boost converter, as required by independent claims 60, 62, and 64, as well as dependent claims 13, 30, 46, and 54.

The Examiner erroneously argued that a voltage <u>applied to</u> the boost converter is not synonymous with the voltage <u>inputted into</u> the boost converter.[86] The Examiner further stated that any of the voltages used by the boost converter are "applied to" at least a portion of the boost converter.[87] As is well-established, during patent examination, the pending claims must be given their broadest reasonable interpretation consistent with the specification.[88] The

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[84] Final Office Action dated 03/30/09 at p. 4, item 7.
[85] Kotowski at FIG. 3 and col. 5, ll. 23–28.
[86] Final Office Action dated 3/30/09 at p. 8, item 15.
[87] *Id.*
[88] *Phillips v. AWH Corp.*, 415 F.3d 1303, 1316 (Fed. Cir. 2005); *see also* MPEP 2111.

Examiner's interpretation of independent claims 60, 62, and 64 is unreasonable and inconsistent with Appellant's specification. As discussed in Appellant's specification, a battery voltage can be decreased, thereby reducing an input voltage to a boost converter and inhibit pulse skipping.[89] Appellant's disclosure also states that an input voltage level V_IN for application to a boost converter can be reduced when the input voltage level V_IN exceeds a threshold voltage.[90] Thus, Appellant's claim language itself, as well as the specification, indicates that a voltage applied to a boost converter can be an input voltage. For at least these reasons, the Examiner erred in asserting that a voltage applied to a boost converter not synonymous with the voltage inputted into the boost converter.

Contrary to the Examiner's assertion, Kotowski fails to disclose or suggest limiting a level of a battery voltage applied to a boost converter when the battery voltage exceeds a threshold voltage, thereby inhibiting performance of pulse skipping by the boost converter, as required by Appellant's independent claims 60, 62, and 64. It is clear from FIGS. 3 and 5 of Kotowski that one voltage, the input voltage from the battery, is applied to the DC-DC converter 300. Although the converter 300 may manipulate that voltage within the converter, the only voltage applied to converter 300 is the input voltage from the battery, which Kotowski fails to disclose, is limited to inhibit performance of pulse skipping by a boost converter. Thus, the both the Examiner's assertion that a voltage applied to the boost converter is not synonymous with the voltage inputted into the boost converter[91] and the rejection of independent claims 60, 62, and 64 as being obvious over Kotowski in view of Lebel was erroneous.

Claims 13, 30, 46, and 54

Dependent claims 13, 30, 46, and 54 depend from one of independent claims 1, 18, 35, and 51, and are patentable over Kotowski in view of Lebel for at least the reasons discussed with respect to independent claims 1, 18, 35, and 51. In addition, dependent claims 13, 30, 46, and 54 each require inhibiting pulse skipping by a boost converter by limiting the level of the battery voltage applied to the boost converter. As discussed with respect to independent claims 60, 62,

[89] Appellant's disclosure at p. 8, l. 31 – p. 9, l. 2.
[90] *Id.* at p. 10, ll. 8–10.
[91] Final Office Action dated 3/30/09 at p. 8, item 15.

and 64, Kotowski in view of Lebel fails to disclose or suggest inhibiting pulse skipping by a boost converter by limiting the level of the battery voltage applied to the boost converter. Thus, the Examiner's final rejection of claims 13, 30, 46, and 54 as being obvious over Kotowski in view of Lebel was erroneous and should be reversed.

Claims 4, 21, 38, 63, and 65

With respect to dependent claims 4, 21, 38, 63, and 65, Kotowski fails to disclose or suggest a transistor that transmits the battery voltage to the boost converter when the transistor is ON, wherein the transistor turns OFF when the battery voltage exceeds the threshold voltage. In support of the rejection of claims 4, 21, 38, 63, and 65, the Examiner cited switched a capacitor array 10 of FIG. 5 of Kotowski.[92] As described previously, switched capacitor array 10 is a component of the DC-DC converter and an input voltage from a battery is input to the switched capacitor array. Kotowski does not disclose or suggest that the switched capacitor array 10 is a transistor or includes a transistor that transmits the battery voltage to the DC-DC converter when the transistor is ON, or that a transistor turns OFF when the battery voltage exceeds the threshold voltage.

Nothing in Kotowski discloses or suggests that the DC-DC converter receives different inputs based on battery voltage, as controlled by switching of a transistor. Instead, Kotowski discloses that a capacitor array 10 within the DC-DC converter merely receives the input voltage from the battery.[93] While Kotowski discloses that the gain of capacitor array 10 <u>within</u> the DC-DC converter may be adjusted, Kotowski does not disclose a transistor coupled to transmit the battery voltage to the DC-DC converter when the transistor is ON, where the transistor turns OFF when the battery voltage exceeds the threshold. Thus, the Examiner's rejection of claims 4, 21, 38, 63, and 65 as being obvious over Kotowski in view of Lebel was erroneous.

Dependent Claims 6–9, 23–26, and 39–42

Each of claims 6–9, 23–26, and 39–42 depends upon one of claims 4, 21, and 38 and further requires that the transistor transmits the battery voltage, less a body diode drop, to the

[92] *Id.* at pp. 3 and 4, item 7.
[93] *See* Kotowski at FIG. 3.

boost converter when the transistor is OFF. Kotowski fails to disclose or suggest that the DC-DC converter receives any value other than the battery voltage. Accordingly, contrary to the Examiner's assertions, Kotowski in view of Lebel fails to disclose or suggest a transistor that transmits the battery voltage, less a body diode drop, to a boost converter when the transistor is OFF, as required by claims 6–9, 23–26, and 39–42. Kotowski also fails to disclose or suggest the specific transistor configurations required by claims 6–9, 23–26, and 39–42.

Claims 5, 22, and 61

With respect to claims 5, 22, and 61, Kotowski in view of Lebel fails to disclose or suggest a comparator to compare the battery voltage to the threshold voltage, where an output of the comparator is coupled to a gate of the transistor to turn the transistor ON and OFF based on the comparison. The Examiner stated that it is generally well-known in the electronic arts to utilize comparators to determine when values exceed thresholds and to utilize MOSFET/MOSFET pairs that transmit a battery voltage less a body diode/resister voltage/external diode drop to provide reliable switching with common off-the-shelf parts. Appellant respectfully disagrees with the Examiner's assertion of knowledge in the art. The Examiner's assertion of knowledge in the art is not capable of instant and unquestionable demonstration as being well-known, and, therefore was improperly asserted.[94] For example, the specific purpose provided by the Examiner appears to be an assertion of technical fact that requires specific knowledge in the art. These types of assertions must be supported by citation to a reference.[95]

Based on the assertion of knowledge in the art, the Examiner reasoned that it would have been obvious to modify Kotowski by providing a comparator to provide the predictable result of determining when the input value exceeds a threshold with common off-the-shelf parts.[96] In the Response to Arguments section, the Examiner also acknowledged that Kotowski does not disclose or suggest comparing the battery voltage to a threshold value.[97]

[94] *See* MPEP 2144.03, *citing In re Ahlert*, 424 F.2d 1088, 1091 (CCPA 1970).
[95] *In re Ahlert*, 424 F.2d at 1091.
[96] Final Office Action dated 3/30/09 at p. 4, item 8.
[97] Office Action dated 10/16/08. at pp. 6 and 7, item 12.

Even if it is known to use comparators in the electronics art, an assertion with which Appellant does not necessarily agree, there is no reasonable rationale why one of ordinary skill in the art would have modified Kotowski to include a comparator for the specific application of comparing the battery voltage to a threshold value. In Kotowski, a comparator compares an output voltage of a switched capacitor circuit, which is used to boost a voltage, to a desired output voltage for the capacitor circuit. Modifying the Kotowski comparator to compare two different voltage values, as suggested by the Examiner, would change the principle of operation of the Kotowski comparator and the Kotowski system. If a proposed modification of a cited reference would change the principle of operation of the system being modified, the reference is insufficient to render Appellant's claims *prima facie* obvious.[98] Thus, the Examiner's proposed modification to Kotowski is insufficient to establish a *prima facie* case of obviousness of at least claims 5, 22, and 61.

Claims 5, 22, and 61 also require the threshold voltage to be the same threshold voltage at which pulse skipping by a boost converter is inhibited. As discussed above, Kotowski fails to disclose or suggest inhibiting pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage. The Examiner characterized the claimed threshold voltage as an "arbitrary level which causes the appropriate number of 'skip' signals to be generated to modify the gain."[99] There is no rational reason why one having ordinary skill in the art would have modified Kotowski to include a comparator to compare the battery voltage to an "arbitrary" voltage or how such comparison to an arbitrary voltage would be accomplished.

A rejection based on obviousness must be supported with an articulated reasoning with a rational underpinning, which the Examiner has failed to provide.[100] The Examiner has failed to provide a rational reason to support the conclusion of obviousness of claims 5, 22, and 61. For example, the Examiner has not provided a rational reason one of ordinary skill in the art would have modified Kotowski in view of Lebel to compare a battery voltage to an arbitrary level (which the Examiner characterized as a "threshold" voltage). If the voltage is indeed an arbitrary level as the Examiner asserts, comparison of a battery voltage is greater than a threshold voltage

[98] MPEP 2143.02, *citing In re Ratti*, 270 F.2d 810 (CCPA 1959).
[99] Final Office Action dated 3/30/09 at p. 7, item 12.
[100] *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

would appear to be a meaningless task that one having ordinary skill in the art would have no reason to implement.

Claims 66–69

Claims 66 and 69 require a comparator that compares a level of a battery voltage to a threshold voltage, whereby pulse skipping by a boost converter is inhibited when the level of the battery voltage is greater than the threshold voltage. Claim 67 recites a method that includes comparing the level of the battery voltage to the threshold voltage, and claim 68 recites a system comprising means for comparing the level of the battery voltage to the threshold voltage.

Kotowski in view of Lebel fails to disclose each and every element of Appellant's claims 66–69. In support of the rejection of claims 66–69, the Examiner asserted that Kotowski discloses a comparator, but does not disclose a comparator that compares a level of a battery voltage to a threshold voltage. The Examiner asserted, however, that because Appellant has not disclosed that the comparator provides an advantage, is used for a particular purpose, or solves a state problem, it would have been an obvious matter of design choice to a person of ordinary skill in the art to modify the comparator of Kotowski to compare a level of a battery voltage to a threshold voltage because Appellant has not disclosed that a comparator provides an advantage, is used for a particular purpose or solves a stated problem.[101] The Examiner's conclusion of obviousness is erroneous.

As an initial matter, Appellant notes that the "obvious matter of design choice" rationale is by itself insufficient to support the rejection of claims 66–69 under 35 U.S.C. § 103(a). In order to establish a *prima facie* case of obviousness, the Examiner must still provide a rational reason why one having ordinary skill in the art would have modified Kotowski to include the comparator of Appellant's claims 66 and 69.[102] The Examiner has failed to do so. Even if reliance on the "design choice" rationale to support the rejection of claims 66–69 can be proper, the Examiner has failed to properly assert the "obvious matter of design choice" rationale. The Examiner appears to be pulling the "obvious matter of design choice" rationale from legal precedent, which is only permissible if the facts in the prior legal decision are sufficiently similar

[101] Final Office Action dated 3/30/09 at pp. 6 and 7, item 10.
[102] *KSR*, 550 U.S. 418.

to those in the application under examination.[103] The "obvious matter of design choice" rationale was used in *In re Kuhle*,[104] which relates to a rearrangement of parts. The Examiner did not use the "obvious matter of design choice" rationale to support an assertion that it would have been obvious to rearrange parts of the Kotowski system to arrive at Appellant's claimed invention.

Moreover, even if the "obvious matter of design choice" is relied upon to support an obviousness rejection, the prior art must still provide a motivation or reason for one having ordinary skill in the art to make the necessary changes in a reference device.[105] "The mere fact that a worker in the art could rearrange the parts . . . is not by itself sufficient to support a finding of obviousness."[106]

The Examiner also erroneously asserted that Appellant has not established that the comparator that compares a level of a battery voltage to a threshold voltage is used for a particular purpose. Claims 66 and 69 depend from claims 1 and 51, respectively, which explicitly state that pulse skipping by a boost converter is inhibited when the level of the battery voltage is greater than the threshold voltage. Thus, the comparator is used to determine when the pulse skipping by the boost converter is inhibited. Appellant's disclosure also describes an example in which a comparator 58 compares the input voltage level V_IN to a threshold voltage level V_TH and an input circuit 54 reduces the input voltage level V_IN for application to a boost converter 56 when the comparator 58 indicates that the input voltage level V_IN exceeds the threshold voltage V_TH.[107] Thus, Appellant has clearly established that a comparator is used for a particular purpose.

As acknowledged by the Examiner,[108] the cited references fail to disclose or suggest a comparator that compares a level of a battery voltage to a threshold voltage, as recited by claims 66 and 69 or comparing the level of the battery voltage to the threshold voltage, as recited by

[103] *See* MPEP 2144.04.
[104] *In re Kuhle*, 526 F.2d 533 (CCPA 1975).
[105] *Ex parte Chicago Rawhide Mfg. Co.*, 233 USPQ 351, 353 (BPAI 1984).
[106] *Id.*
[107] Appellant's disclosure at p. 10, ll. 7–10.
[108] Final Office Action dated 3/30/09 at p. 5, item 10.

claims 67 and 68. Accordingly, the rejection of claims 66–69 was improper and should be reversed.

For at least these reasons, the Examiner has failed to establish a *prima facie* case for non-patentability of Appellant's claims 1–10, 12–27, 29–43, 45–51, and 53–65 under 35 U.S.C. § 103(a). The rejection of claims 1–10, 12–27, 29–43, 45–51, and 53–65 is in error and must be reversed.

CONCLUSION

The Examiner has failed to meet the burden of establishing a *prima facie* case of obviousness with respect to claims 1–10, 12–27, 29–43, 45–51, and 53–69. In view of Appellant's arguments, the final rejection of Appellant's claims is improper and should be reversed. Reversal of all pending rejections and allowance of all pending claims is respectfully requested. Appellant respectfully requests separate review by the Board for each set of claims argued under a separate heading.

Date: August 31, 2009

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APPENDIX A

THE CLAIMS ON APPEAL

1. A programmer for a medical device, the programmer comprising:

a wireless telemetry circuit adapted to communicate with the medical device;

a boost converter adapted to convert a battery voltage to an operating voltage for the programmer; and

a control circuit adapted to inhibit pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage.

2. The programmer of claim 1, wherein the boost converter activates pulse skipping when the operating voltage exceeds a reference voltage.

3. The programmer of claim 1, wherein the boost converter is a fixed-frequency switching mode boost converter.

4. The programmer of claim 1, wherein the control circuit includes a transistor coupled to transmit the battery voltage to the boost converter when the transistor is ON, wherein the transistor turns OFF when the battery voltage exceeds the threshold voltage.

5. The programmer of claim 4, wherein the control circuit includes a comparator to compare the battery voltage to the threshold voltage, wherein an output of the comparator is coupled to a gate of the transistor to turn the transistor ON and OFF based on the comparison.

6. The programmer of claim 4, wherein the transistor includes a MOSFET, and the transistor transmits the battery voltage, less a body diode drop of the MOSFET, to the boost converter when the transistor is OFF.

7. The programmer of claim 4, wherein the transistor includes a MOSFET, and the transistor transmits the battery voltage, less a resistor voltage drop, to the boost converter when the transistor is OFF.

8. The programmer of claim 4, wherein the transistor includes a MOSFET, and the transistor transmits the battery voltage, less an external diode drop, to the boost converter when the transistor is OFF.

9. The programmer of claim 4, wherein the transistor includes a back-to-back MOSFET pair having a first MOSFET and a second MOSFET, and the transistor transmits the battery voltage less an external diode drop, to the boost converter when each of the first and second MOSFETs is OFF.

10. The programmer of claim 1, wherein the wireless telemetry circuit includes an antenna mounted internally within a housing associated with the programmer.

12. The programmer of claim 1, wherein the threshold voltage is approximately 2.4 volts to 2.6 volts.

13. The programmer of claim 1, wherein the control circuit inhibits pulse skipping by the boost converter by limiting the level of the battery voltage applied to the boost converter.

14. The programmer of claim 1, further comprising a battery source to produce the battery voltage.

15. The programmer of claim 14, wherein the battery source includes two or more AAA battery cells, AA battery cells, C battery cells, or D battery cells.

16. The programmer of claim 1, wherein the programmer is a handheld neurostimulation programmer.

17. The programmer of claim 1, wherein the operating voltage is approximately 2.2 to 3.2 volts.

18. A method for controlling a power supply in a programmer for a medical device, the method comprising:

applying a battery voltage to a boost converter to convert the battery voltage to an operating voltage for the programmer; and

inhibiting pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage.

19. The method of claim 18, further comprising activating pulse skipping by the boost converter when the operating voltage exceeds a reference voltage.

20. The method of claim 18, wherein the boost converter is a fixed-frequency switching mode boost converter.

21. The method of claim 18, further comprising transmitting the battery voltage to the boost converter via a transistor, and turning the transistor OFF when the battery voltage exceeds the threshold voltage.

22. The method of claim 21, further comprising comparing the battery voltage to the threshold voltage with a comparator, wherein an output of the comparator is coupled to a gate of the transistor to turn the transistor ON and OFF based on the comparison.

23. The method of claim 21, wherein the transistor is a MOSFET, and the transistor transmits the battery voltage less a body diode drop of the MOSFET to the boost converter when the transistor is OFF.

24. The method of claim 21, wherein the transistor includes a MOSFET, and the transistor transmits the battery voltage, less a resistor voltage drop, to the boost converter when the transistor is OFF.

25. The method of claim 21, wherein the transistor includes a MOSFET, and the transistor transmits the battery voltage, less an external diode drop, to the boost converter when the transistor is OFF.

26. The method of claim 21, wherein the transistor includes a back-to-back MOSFET pair having a first MOSFET and a second MOSFET, and the transistor transmits the battery voltage less an external diode drop, to the boost converter when each of the first and second MOSFETs is OFF.

27. The method of claim 18, wherein the programmer includes wireless telemetry circuitry with an antenna mounted internally within a housing associated with the programmer.

29. The method of claim 18, wherein the threshold voltage is approximately 2.4 volts to 2.6 volts.

30. The method of claim 18, further comprising inhibiting pulse skipping by the boost converter by limiting the level of the battery voltage applied to the boost converter.

31. The method of claim 18, further comprising supplying the battery voltage from a battery source.

32. The method of claim 31, wherein the battery source includes two or more AAA battery cells, AA battery cells, C battery cells, or D battery cells.

33. The method of claim 18, wherein the programmer is a handheld neurostimulation programmer.

34. The method of claim 18, wherein the operating voltage is approximately 2.2 to 3.2 volts.

35. A system for controlling a power supply in a programmer for a medical device, the system comprising:

means for applying a battery voltage to a boost converter to convert the battery voltage to an operating voltage for the programmer; and

means for inhibiting pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage.

36. The system of claim 35, further comprising means for activating pulse skipping by the boost converter when the operating voltage exceeds a reference voltage.

37. The system of claim 35, wherein the boost converter is a fixed-frequency switching mode boost converter.

38. The system of claim 35, wherein the battery voltage is transmitted to the boost converter via a transistor, the system further comprising means for turning the transistor OFF when the battery voltage exceeds the threshold voltage.

39. The system of claim 38, wherein the transistor is a MOSFET, and the transistor transmits the battery voltage less a body diode drop of the MOSFET to the boost converter when the transistor is OFF.

40. The system of claim 38, wherein the transistor includes a MOSFET, and the transistor transmits the battery voltage, less a resistor voltage drop, to the boost converter when the transistor is OFF.

41. The system of claim 38, wherein the transistor includes a MOSFET, and the transistor transmits the battery voltage, less an external diode drop, to the boost converter when the transistor is OFF.

42. The system of claim 38, wherein the transistor includes a back-to-back MOSFET pair having a first MOSFET and a second MOSFET, and the transistor transmits the battery voltage less an external diode drop, to the boost converter when each of the first and second MOSFETs is OFF.

43. The system of claim 35, wherein the programmer includes wireless telemetry circuitry with an antenna mounted internally within a housing associated with the programmer.

45. The system of claim 35, wherein the threshold voltage is approximately 2.4 volts to 2.6 volts.

46. The system of claim 35, further comprising means for inhibiting pulse skipping by the boost converter by limiting the level of the battery voltage applied to the boost converter.

47. The system of claim 35, further comprising a battery source to supply the battery voltage.

48. The system of claim 47, wherein the battery source includes two or more AAA battery cells, AA battery cells, C battery cells, or D battery cells.

49. The system of claim 35, wherein the programmer is a handheld neurostimulation programmer.

50. The system of claim 35, wherein the operating voltage is approximately 2.2 to 3.2 volts.

51. A neurostimulation system comprising:

an implantable neurostimulator; and

a programmer for the neurostimulator, the programmer including a wireless telemetry circuit adapted to communicate with the medical device, a boost converter adapted to convert a battery voltage to an operating voltage for the programmer, wherein the boost converter activates pulse skipping when the operating voltage exceeds a reference voltage, and the boost converter is a fixed-frequency switching mode boost converter, and a control circuit adapted to inhibit pulse skipping by the boost converter when a level of the battery voltage is greater than a threshold voltage.

53. The system of claim 51, wherein the threshold voltage is approximately 2.4 volts to 2.6 volts.

54. The system of claim 51, wherein the control circuit inhibits pulse skipping by the boost converter by limiting the level of the battery voltage applied to the boost converter.

55. The system of claim 51, further comprising a battery source to produce the battery voltage.

56. The system of claim 55, wherein the battery source includes two or more AAA battery cells, AA battery cells, C battery cells, or D battery cells.

57. The system of claim 51, wherein the programmer is a handheld neurostimulation programmer.

58. The system of claim 51, wherein the operating voltage is approximately 2.2 to 3.2 volts.

59. The programmer of claim 1, further comprising a battery voltage monitor coupled to the control circuit, wherein the battery voltage monitor monitors the level of the battery voltage.

60. A programmer for a medical device, the programmer comprising:

a wireless telemetry circuit configured to communicate with the medical device;

a fixed-frequency, switching mode boost converter configured to convert a battery voltage to an operating voltage for the programmer, wherein the boost converter performs pulse skipping when the operating voltage exceeds a reference voltage; and

a control circuit configured to limit a level of the battery voltage applied to the boost converter when the battery voltage exceeds a threshold voltage, thereby inhibiting performance of pulse skipping by the boost converter.

61. The programmer of claim 60, wherein the control circuit includes a transistor coupled to transmit the battery voltage to the boost converter when the transistor is ON, wherein the transistor turns OFF when the battery voltage exceeds the threshold voltage, and wherein the control circuit includes a comparator to compare the battery voltage to the threshold voltage, wherein an output of the comparator is coupled to a gate of the transistor to turn the transistor ON and OFF based on the comparison.

62. A method for controlling a power supply in a programmer for a medical device, the method comprising:

applying a battery voltage to a fixed-frequency, switching mode boost converter to convert the battery voltage to an operating voltage for the programmer, wherein the boost converter performs pulse skipping when the operating voltage exceeds a reference voltage; and

limiting a level of the battery voltage applied to the boost converter when the battery voltage exceeds a threshold voltage, thereby inhibiting performance of pulse skipping by the boost converter.

63. The method of claim 62, further comprising transmitting the battery voltage to the boost converter via a transistor when the transistor is ON, wherein limiting a level of the battery voltage applied to the boost converter comprises turning the transistor OFF when the battery voltage exceeds the threshold voltage.

64. A device for controlling a power supply in a programmer for a medical device, the device comprising:

means for applying a battery voltage to a fixed-frequency, switching mode boost converter to convert the battery voltage to an operating voltage for the programmer, wherein the boost converter performs pulse skipping when the operating voltage exceeds a reference voltage; and

means for limiting a level of the battery voltage applied to the boost converter when the battery voltage exceeds a threshold voltage, thereby inhibiting performance of pulse skipping by the boost converter.

65. The method of claim 64, further comprising means for transmitting the battery voltage to the boost converter via a transistor when the transistor is ON, wherein the means for limiting a level of the battery voltage applied to the boost converter comprises means for turning the transistor OFF when the battery voltage exceeds the threshold voltage.

66. The programmer of claim 1, further comprising a comparator that compares the level of the battery voltage to the threshold voltage.

67. The method of claim 18, further comprising comparing the level of the battery voltage to the threshold voltage.

68. The system of claim 35, further comprising means for comparing the level of the battery voltage to the threshold voltage.

69. The system of claim 51, wherein the programmer comprises a comparator that compares the level of the battery voltage to the threshold voltage.

APPENDIX B

EVIDENCE

NONE

APPENDIX C

RELATED PROCEEDINGS

NONE